REMARKS

Applicants have amended their claims in order to further clarify the definition of various aspects of the present invention. Specifically, Applicants set forth the subject matter of claims 26-28 in independent form. Noting the comment by the Examiner in Item 7 on page 6 of the Office Action mailed December 12, 2005, claims 26-28 should be allowed.

Moreover, Applicants have amended claims 1, 3 and 7 to recite that the carbon contained in the catalyst carrier is amorphous or crystalline carbon. In light of these amendments to claims 1, 3 and 7, claims 14, 21 and 23 have been cancelled without prejudice or disclaimer. In addition, claim 15 has been amended to recite specific materials for the atoms that have formed covalent bonds with the metal catalyst component, consistent with the atoms recited in claim 7. Moreover, claims 16, 18, 22 and 24 have been amended to recite "a" surface.

Initially, it is respectfully requested that the present amendments be entered, notwithstanding Finality of the Office Action mailed December 12, 2005. Clearly, amendments to claims 26-28 are proper, especially in light of the Examiner's indication of allowable subject matter. Moreover, noting previously considered claims 14, 21 and 23, it is respectfully submitted that the present amendments to claims 1, 3 and 7 do not raise any new issues, including any issue of new matter. Further in connection with these amendments to claims 1, 3 and 7, attention is respectfully directed to the statement of the Examiner, on page 5, lines 10-12 of the Office Action mailed December 12, 2005; it is respectfully submitted that Applicants have taken up the advice of the Examiner, to incorporate the disclosure on page 4, lines 10-12, "into the

claims". Moreover, noting the further definition of the carbon as set forth in claims 1, 3 and 7; noting amendments to the claims to recite "a" surface, thereby overcoming antecedent basis issues; and, moreover, setting forth subject matter in independent form that the Examiner has indicated is allowable, in claims 26-28, it is respectfully submitted that the present amendments materially limit issues remaining in connection with the above-identified application; and, at the very least, present the claims in better form for appeal. Noting contentions by the Examiner in the Office Action mailed December 12, 2005, particularly as set forth on pages 4-6 thereof, it is respectfully submitted that the present amendments are clearly timely.

In view of the foregoing, it is respectfully submitted that Applicants have made the necessary showing under 37 CFR 1.116(c); and that , accordingly, entry of the present amendments is clearly proper.

The objection to claim 15 under 37 CFR 1.75, as being a substantial duplicate of claim 14, set forth in Item 2 on page 2 of the Office Action mailed December 12, 2005, is noted. In view of canceling of claim 14 and amendment of claim 15, it is respectfully submitted that this objection is moot.

The rejection of claims 16-19, 22 and 24 under the second paragraph of 35 USC 112, as being indefinite, set forth in Item 3 on pages 2 and 3 of the Office Action mailed December 12, 2005, is noted. Applicants have amended claims 16, 18, 22 and 24 to recite "a" surface of the catalyst carrier; accordingly, it is respectfully submitted that there is no need for antecedent basis for this "surface", in view of use of the article "a". Noting that claims 17 and 19 respectively are dependent on claims 16 and 18, which recite "a surface of the catalyst carrier", it is respectfully submitted that recitation in

claims 17 and 19 of "the" surface of the catalyst carrier, is proper.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the reference applied by the Examiner in rejecting claims in the Office Action mailed December 9, 2005, that is, the teachings of U.S. Patent No. 6,380,126 to Finkelshtain, et al., under the provisions of 35 USC 102 and 35 USC 103.

It is respectfully submitted that this reference as applied by the Examiner would have neither taught nor would have suggested such catalytic material as in the present claims, having a catalyst carrier for supporting a metal catalytic component, which catalyst carrier contains, inter alia, carbon, the carrier also containing atoms that have formed covalent bonds with the metal catalytic component, and wherein the carbon contained in the catalyst carrier is amorphous or crystalline carbon. See claim 1; note also claims 3 and 7.

In addition, it is respectfully submitted that these references would have neither taught nor would have suggested such catalytic material as in the present claims, including the metal catalytic component and catalyst carrier comprising carbon, the carbon being amorphous or crystalline carbon, and wherein the catalyst carrier has a structure in which part of the carbon atoms is replaced with the atoms that have formed covalent bonds with the metal catalytic component. See claim 3.

Moreover, it is respectfully submitted that the applied references would have neither disclosed nor would have suggested such catalytic material as in the present claims, wherein the catalyst carrier for supporting the metal catalytic component contains carbon and at least one member selected from the group consisting of

nitrogen atoms, oxygen atoms, phosphorus atoms and sulfur atoms, the carbon contained in the catalyst carrier being amorphous or crystalline. See claim 7; note also claim 15.

Furthermore, it is respectfully submitted that these applied references would have neither taught nor would have suggested such catalytic material as in the present claims, having features as discussed previously in connection with claims 1, 3 and 7, and, moreover, wherein the at least one member selected from the group specified in claim 7 has formed covalent bonds with the metal catalytic component (see claim 12; note claim 15); and/or wherein the atoms that have formed covalent bonds with the metal catalytic component (or the at least one atom) are chemically bonded to the carbon (see claims 13, 20 and 25); and/or material of the metal catalytic component (see claims 4-6); and/or wherein the atoms (e.g., nitrogen) forming covalent bonds with the catalyst component is on the surface of the carrier (see claims 16, 18, 22 and 24), and are present on the surface in an amount as set forth in claims 17 and 19.

The invention as claimed in the above-identified application relates to a catalytic material, for use, e.g., in fuel cells. As described in the first full paragraph on page 2 of Applicants' specification, catalytic materials used for the electrodes and other components of these fuel cells generally take a configuration in which catalysts are dispersed on catalyst carriers. However, the activity of catalytic materials greatly depends on the particle sizes of the catalytic components, and decreases as the active area decreases.

In conventional catalytic materials, since respective metal catalytic components are supported on catalyst carriers mainly by physical adsorption, particles of these

metal catalytic components cohere or grow during the preparation of the catalytic materials; and, consequently, particles of the metal catalytic component increase in size to decrease specific surface area and thus decrease the activity of the catalyst.

Against this background, Applicants provide a catalytic material which can easily and effectively be provided, at relatively low cost using available materials, yet which does not have reduced catalyst component active area with resulting reduced activity. Applicants have found that particles of a metal catalytic component can be prevented from cohesion by forming covalent bonds between the metal catalytic component and atoms in the catalyst carrier, and that through use of carbon, i.e., amorphous or crystalline carbon, contained in the catalyst carrier an effective catalytic material can be achieved from known materials, easily and effectively. Furthermore, since coherence of particles of the metal catalytic component can be avoided, amount of catalyst carrier can be reduced when the same amount of catalytic component is included in an electrode; and the fact that the amount of catalyst carrier can be reduced means that given the same electrode area, the thickness of the electrode can be reduced, and diffusion of a fuel in the electrode, conductivity of electrons and conductivity of protons can be improved. In addition, output density can also be improved. Note, in particular, the paragraph bridging pages 11-13 of Applicants' specification.

Finkelshtain, et al. discloses electrocatalysts based on highly electroconducting polymers that have transition metal atoms covalently bonded to backbone heteroatoms. See column 1, lines 7-12. Note also column 3, lines 36-40. Various highly electrically conductive polymers are described, for example, at column 2, lines 60-66, and column 4, lines 15-17; and preferred transition metals are described, for example, in column 4,

lines 17-20. Note also column 5, lines 9-12.

It is respectfully submitted that Finkelshtain, et al. would have neither taught nor would have suggested the presently claimed catalytic material, including, inter alia, wherein the catalyst carrier thereof contains carbon, and wherein the contained carbon is amorphous or crystalline carbon.

In particular, note the definition of "carbon" on page 4, lines 10-12 of Applicants' specification. See claims 1, 3 and 7 as presently amended, reciting that the carbon contained in the catalyst carrier is amorphous or crystalline carbon. It is respectfully submitted that these materials described in Applicants' specification, and recited in present claims 1, 3 and 7, are much different from the highly electroconductive polymer (e.g., polyaniline, polypyrrole, polythiophene and/or polyfuran) disclosed in Finkelshtain, et al. It is respectfully submitted that Finkelshtain, et al. would have neither taught nor would have suggested the catalytic material as in the present claims, including, inter alia, the catalyst carrier containing carbon which is amorphous or crystalline carbon.

In the fourth paragraph on page 5 of the Office Action mailed December 12, 2005, the Examiner states that a review of Fig. 2c (apparently of Finkelshtain, et al.) shows a catalyst support comprising "a carbon material" in the organic ring and heteroatoms along the chain which provide covalent bonding with the catalyst metal. It is emphasized that the Examiner refers to a catalyst support comprising "a carbon material". It is respectfully submitted that the organic monomer forming the polymer of Finkelshtain, et al., wherein the carbon forms part of, e.g., benzene rings, would have neither taught nor would have suggested the presently claimed subject matter, wherein the catalyst carrier contains carbon, the carbon being amorphous or crystalline carbon,

and advantages thereof.

The statement by the Examiner in lines 8 and 9 on page 4 of the Office Action mailed December 12, 2005, that in Finkelshtain, et al., the carbon component is one of amorphous or crystalline, is noted. Initially, note that the Examiner has not pointed to any portion of Finkelshtain, et al. disclosing that a "carbon component" thereof is amorphous or crystalline; the Examiner is respectfully challenged to point out the specific portion of the reference disclosing this.

Moreover, it is noted that the present claims recite that the carbon (not carbon component) contained in the catalyst carrier is amorphous or crystalline carbon. It is respectfully submitted that giving the present claims the broadest reasonable interpretation, including the recitation in the present claims that the carbon contained in the catalyst carrier is amorphous or crystalline carbon, the "carbon component" as alleged by the Examiner as being one of amorphous or crystalline would have neither taught nor would have suggested the carbon being amorphous or crystalline carbon, as in the present claims.

As can be seen from page 4, lines 8 and 9, and from the fourth paragraph on page 5, of the Office Action mailed December 12, 2005, the Examiner refers to the "carbon component" and the "carbon material" in Finkelshtain, et al. Clearly, the polymer backbone in Finkelshtain, et al. is a highly electroconducting polymer containing, for example, organic materials in which carbon substituents form part of the material. However, it is respectfully submitted that such carbon-containing material as in Finkelshtain, et al., as part of the entire structure of the reference, would have neither taught nor would have suggested the presently claimed subject matter, including, inter

alia, wherein the carbon contained in the catalyst carrier is amorphous or crystalline carbon (e.g., the carbon itself is amorphous or crystalline carbon).

Applicants respectfully traverse the conclusion by the Examiner that Fig. 2c in Finkelshtain, et al. shows nitrogen atoms located on the carrier surface between adjacent carbon rings; and the contention by the Examiner in the sixth full paragraph on page 4 of the Office Action mailed December 12, 2005, that the density of the nitrogen atoms in the carrier relative to the remaining hydrocarbon constituents in the structure in this Fig. 2c is inherently in a range from about 0.1-30 atomic percent. It is respectfully submitted that the Examiner has pointed to no evidence or reasoning supporting the conclusion concerning the "surface" in Fig. 2c; in this regard, note that Fig. 2 shows three of the steps in the preparation of a polyaniline-platinum complex, without reference to a surface. Moreover, it is respectfully submitted that there is no basis from Fig. 2c for the inherency arguments by the Examiner as to density of the nitrogen atoms. Without evidence or reasoning supporting the position taken by the Examiner, clearly such position must fail. See In re McKellin, 188 USPQ 428 (CCPA 1976).

In addition, in the sixth paragraph on page 4 of the Office Action mailed December 12, 2005, the Examiner refers to density of the nitrogen atoms in the carrier relative to the remaining hydrocarbon constituents in the structure of Fig. 2c. However, note that claims 17 and 19 recite a density of nitrogen atoms on the surface of the catalyst carrier. Properly construing claims 17 and 19, as a density on the surface, it is respectfully submitted that Finkelshtain, et al. clearly would have neither taught nor would have suggested the presently claimed subject matter.

In view of the foregoing comments and amendments, entry of the present amendments, and reconsideration and allowance of all claims presently pending in the application, are respectfully requested.

Applicants request any shortage of fees due in connection with the filing of this paper be charged to the Deposit Account of Antonelli, Terry, Stout & Kraus, LLP, Deposit Account No. 01-2135 (case 520.43328X00), and credit any excess payment of fees to such Deposit Account.

Respectfully submitted,

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